

UTILISING BEHAVIOURAL SMS INTERVENTION TO ENHANCE TAX FILING IN KHYBER PAKHTUNKHWA

POLICY BRIEF

June 2023



ABOUT KP's Nudge Unit; The MindLab, Behavioural Insights Unit (BIU)

Sustainable Energy and Economic Development (SEED) and Qatar's B4Development supported the Government of Khyber Pakhtunkhwa in setting up Pakistan's first nudge unit; The MindLab, Behavioural Insights Unit (BIU). The unit is housed in KP's Finance Department and is overseen by an advisory committee headed by KP's Minister Finance and Finance Secretary.

This BIU Experiment 1 has been completed in collaboration with and using support from Khyber Pakhtunkhwa Revenue Authority (KPRA) and B4D Qatar

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Introduction

The policy brief describes the results of a randomised control trial designed for KPRA by KP's Nudge Unit, housing at the Finance Department, Government of Khyber Pakhtunkhwa. The intervention builds on an existing system of text reminder and warning messages to registered taxpayers, to encourage them to file their taxes. This is the first study in Pakistan to use robust experimental design to test the potential of low-cost behavioural interventions in influencing tax-payer behaviour. It tests the impact of replacing the text messages with three types of behaviourally informed messages: those that invoke altruism by highlighting taxes are used for public goods ('equivalent reciprocity', and those that make financial ('loss aversion') and legal ('active choice') consequences of failing to file salient. Results suggest promising potential for message combinations that nudge via highlighting financial and legal penalties and open up interesting avenues of future research.

In the last two decades, there has been significant research on the factors that contribute to tax evasion and compliance; partly motivated by increased policy interest and the willingness of tax authorities to collaborate with researchers to experiment with different strategies to promote compliance (Slemrod, 2019). From seminal work in the developed world that

exhibits the effectiveness of the power of social norms embedded in reminder letters (e.g., Slemrod et al. 2001; Hallsworth et al. 2016;) to the more cost effective method of reaching out via email and SMS in China, Peru, Costa Rica and other developing countries (e.g., Armenak et al. 2020; Brockmeyer et al. 2019; Castro et al. 2022.), behavioural interventions to enhance tax compliance provide valuable guidance for designing effective strategies in this area. 'Nudges' or behaviourally informed interventions seek to do this by changing the respondent's choice structure without relying on coercion and mandates. They may do this using priming and framing the way information is presented in a way that they are likely to significantly impact decision making. Nudges are not meant to replace the legal framework and financial penalties but are meant to compliment the rules and laws to ensure individuals adhere to them. Nudges are often 'light-touch', making certain options more salient; and low cost to implement. One way they achieve cost-effectiveness is via the use of existing infrastructure and, more recently, use of digital technology such as mass messaging and SMS.

Two trends are clear in literature and motivate the design of this study: First, evidence suggests that compliance can be improved, at least in the short run, if the messaging provides concrete evidence to taxpayers that the tax authority has information to detect *and* penalise non-compliance. Personalised messaging can

be effective to this end; however, credibility of the threat of penalty depends on the tax-payer's expectations of enforcement. Two, in-person delivery is more powerful, but it is also more costly. Letters, emails and SMS are cost-effective alternatives, but are less personal and less likely to be paid attention, so the overall welfare superiority of cost-effective methods are unclear (Slemrod, 2019) and may be context specific.

By testing reminder and warning messages that are designed keeping the latest insights from behavioural research, this study explores if SMS interventions can promote tax compliance in the context of sales tax on services in KP, Pakistan. Between July - December 2022, 18,087 firms registered with the KPRA as of June 2022 were randomly selected to receive one of three types of reminder messages, and three types of warning messages, each month, while one (comparison) group of firms did not receive any SMS at all. One control or 'baseline' group continues to receive the typical messages initiated by KPRA in 2019 which only contain reminders to pay before the due date.

We track the filing patterns of study participants for the study months, and we find that no intervention improved the likelihood of filing on time significantly, nor did they change the average amount of tax filed over the study period. However, relative to the status-quo messaging group, the delay in filing was reduced by 4 days for groups that received warning messages

that hinted at financial penalties and legal action. This effect exists for the first month but is not persistent.

Subgroup analysis reveals the loss aversion reminder and active choice combination of messages increases compliance at the intensive margin: taxpayers who typically file more than the sample median amount in monthly returns, or taxpayers who registered with KPRA for longer than the sample median of 30 months, i.e., tax-payers that can be considered relatively more 'compliant', are more likely to file taxes with this message combination than the message combinations being provided by KPRA at baseline. Finally, the filing behaviour of the group that did not receive any SMS was not significantly different from those that received a reminder and a warning message every month, suggesting limited use of the SMS program initiated in 2019 to improve compliance in the study context.

The remainder of this brief will provide a brief overview of the study context, the study design, and the main insights from the experiment for the design of effective, well-targeted interventions to improve tax compliance in the province.

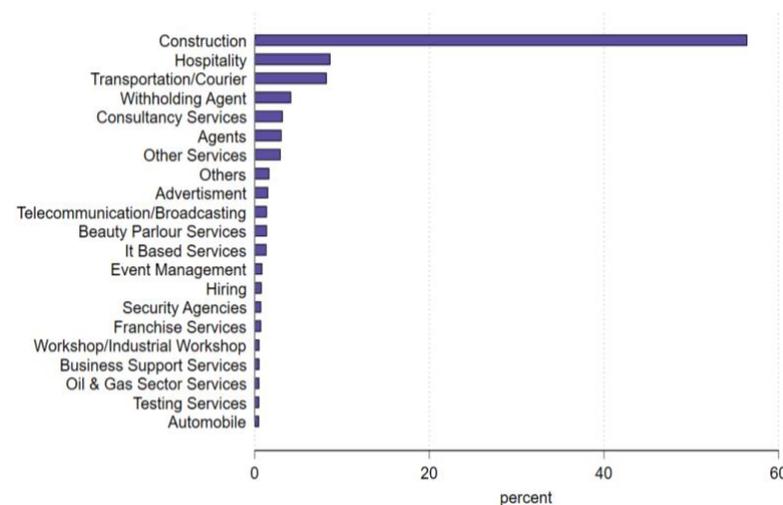
Study Setting

Pakistan's tax revenue has consistently remained around 10% of the country's GDP (Sattar, 2023), similar to other South Asian countries.¹ The responsibility for collecting sales tax, which businesses are required to file every month, was transferred to provinces in 2013. In 2020-21, the Khyber Pakhtunkhwa Revenue Authority (KPRRA) collected PKR 20.8 billion in revenue, three times the amount that was collected in 2013. Among other initiatives to broaden the tax base, KPRRA introduced a SMS campaign in 2019 to encourage registered taxpayers to file taxes on time: tax-payers receive a 'reminder' SMS every month before the due date, and a message after the due date. This policy brief summarises insights from a study conducted 2022 in collaboration with the KPRRA to test if behaviorally informed text in SMS reminders and warning messages can lead to improvement in monthly filing behaviour.

The study was conducted with 18,087 registered tax filers with KPRRA. A fifth (~21%) of the registered taxpayers are corporations. A small proportion (2.7%) of the registered filers were women. Half (49.5%) of the sample is based in Peshawar, a fifth (22.6%) in Mardan, and 13.1%

and 14.8% are based in other areas in the South and North of the province, respectively. More than half the sample belongs to the construction sector (56%), followed by hospitality (9%) and transportation and courier services (8%) (Fig 1).² Table A2 in the appendix provides details of sample characteristics.

Figure 1 - Distribution of sectors in the study sample

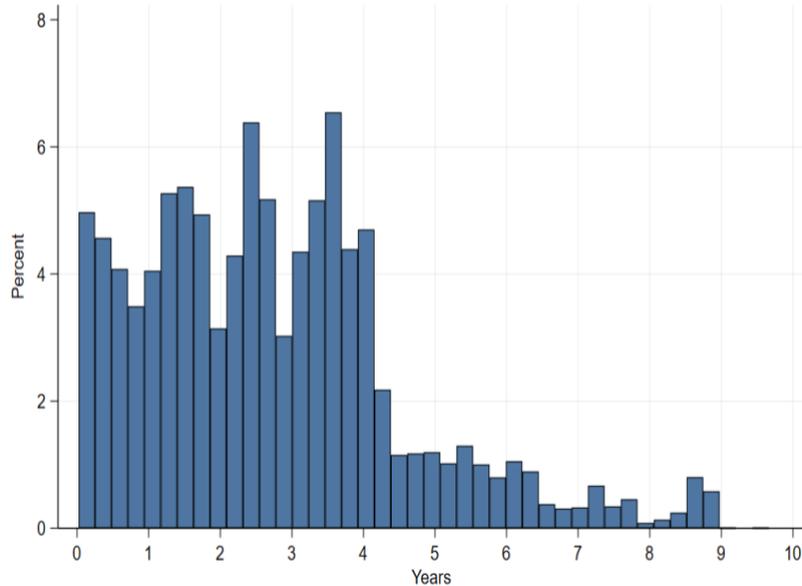


Note: x-axis plots the percentage of each job sector distribution according to data shared by KPRRA. The y-axis reports the categories of sectors involved in the study sample. N = 18087.

¹ Tax-GDP ratio was 12, 7.7 and 11.2% in India, Bangladesh and Sri Lanka, respectively, in 2018 (World Bank: <https://data.worldbank.org/indicator/GC.TAX.TOTL.GD.ZS?locations=8S>). Indeed, the tax-GDP ratio is typically between 10 - 20 percent in low-income countries, compared to near 40% for high-income countries (Besley and Persson, 2014).

² Discussions with KPRRA staff reveals this is likely because it is a legal requirement of the provincial public procurement authority that construction industry agents and intermediaries that provide bids for services must be registered with the KPRRA. Note, the requirement is the bidder should be registered, and not they also need to be filing returns on time (or at all).

Figure 2 - Time since participant first enrolled with KPRA



Note: The x-axis plots the number of years the 18087 study participants have been enrolled with the KPRA, ranging from 0 to 10 (complete) years. The y-axis indicates the percentage of registered participants for specific years enrolled.

Baseline filing behaviour: On average, study participants had been enrolled with KPRA for 3 years. A quarter of the sample had been registered for at least 4 years, with some outliers who have been registered for almost a decade (see Fig 2). While the number of taxpayers registered with the KPRA has been steadily increasing - from a little over 8000 in July 2019 to more than 16000 in February 2022, the compliance has been

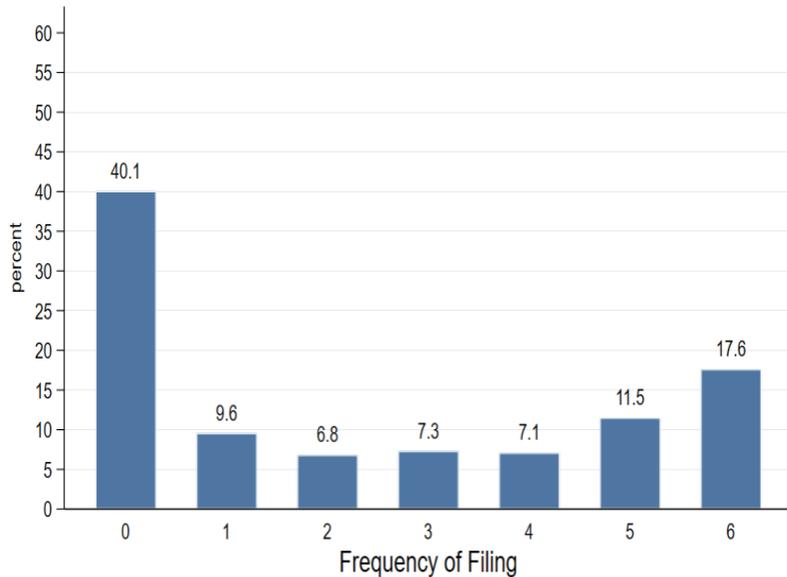
decreasing with a little over half of the registered taxpayers filing their taxes within the allowable time.

Registered taxpayers are required to file sales tax returns for each month by the 15th of the subsequent month, but there are no legal or financial repercussions if returns are filed by the 18th. The experiment was conducted July- December 2022 to affect compliance for the period June - November 2022. We observe that in the same period in the year before, i.e. June - November 2021, nearly a third had filed on or before the 15th of the month at least 4 out of 6 months (Fig 4a); and 17.6% had filed on time every month. However, 40% do not file on time at all. We explore these trends further by looking at *when* tax is filed. Specifically, we look at a period of 5 months after the due date each month (15th of the month), and notice that the percentage of registered taxpayers who do not file at all 5 months after the due date is 29% (reduced from 40% for timely filing); while 51.6% of the sample files within 5 months (Fig4b). This suggests that many taxpayers do file, but they file late, probably lumping the filing returns for a few months together. Finally, it is also worth noting that 80% of the taxpayers who do file, are NULL filers, i.e., they file 0 tax returns (see Figure A2 in the appendix). Of those

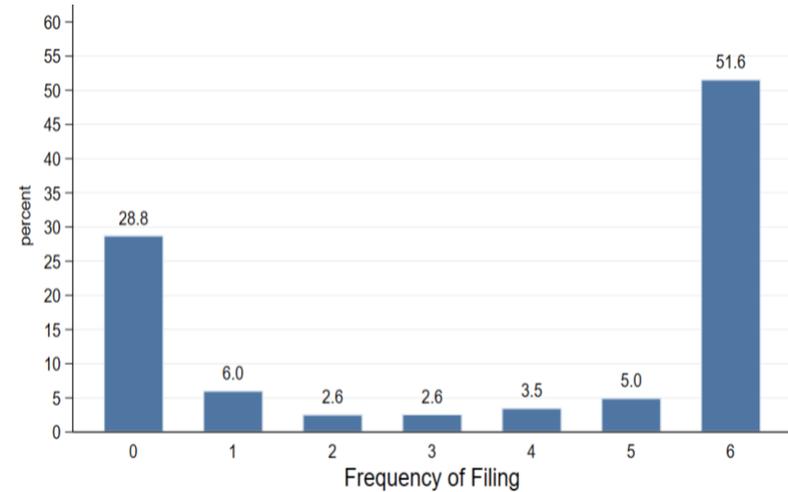
who file a positive amount, median values range from 23,000 - 37,000 in the period Jan 2021 - Apr 2023.³

Figure 3 - Tax filing frequency June 2021 - November 2021

Panel (a) - Number of times monthly tax return filed on or before monthly due date



Panel (b) - Number of times monthly tax return filed within 5 months of the due date.



Note: x-axis plots the frequency or the number of times tax returns have been filed in the 6 month period between June - November 2021. The number of returns that can be filed range from none (0) to 6 (for all months). The y-axis reports the proportion of the same that files for a given level of frequency. Panel (a) plots the number of times tax has been filed 'on time', i.e., on or before the 15th of the month. Panel (b) plots the number of times the tax has been filed post the due date, and within a 5 month (~ 150 day) window. N = 18087 in both panels.

³ Three details are worth noting to understand the large proportion of NULL filing. One, discussions with KPRA staff reveal that payments in the construction sector are usually taxed by third-party as withholding tax, and so many in the construction sector do not file positive returns. Second, though there is no official amnesty scheme in KPRA, legal precedent recognizes that a service provider may not have taxable revenues every month and this has led to a de-facto practice of focusing on returns being filed, without penalties on possible under-reporting in

the amount filed or NULL filing. Collectively, these two factors may partly explain the large proportion of returns that are filed are 'NULL'. Third, it is also worth noting that the deadline for filing returns in two sectors - oil and gas, and telecommunication and broadcasting - is not the 18th, but the 21 - 25th of the month. However, these sectors are approx 2% of our sample and unlikely to be responsible for a large proportion of delayed or lumped filing behaviour.

Study Design

Since 2019, the KPRA has sent monthly SMS messages to remind registered taxpayers that tax returns of the (previous) month are due by the 15th (of current month), and that they must file before the 18th to avoid penalties. Taxpayers who did not file by the 18th, received a warning message to file before the as soon as possible to avoid penalties. This experiment tested several innovations in the reminder and warning message texts to test if there are alternatives that can improve compliance rates.

The content of SMS messages were designed following capacity building workshops held between August and November 2021, focusing on messages that would leverage the power of civic responsibility, threat of penalty, and salience of upcoming due dates. Specifically, the treatment group tested three reminder messages and three warning messages detailed below. The reminder and warning messages were combined using a 3x3 factorial design, giving 9 distinct reminder and warning message combinations. In addition to these 9 groups, a group of taxpayers received no messages - neither a reminder message, nor a warning message.

Taxpayers were individually and randomly selected into one of these 10 groups. Once assigned to a group, a taxpayer remained in that group for the full duration of

the study. Treatments were implemented between June - November 2022. All messages were sent out in Urdu.

Reminder SMS were sent out to all registered tax-payers before the 15th of the relevant month to remind them that they need to file tax by the 18th of the month. For instance, for June filing, reminder messages were sent out on 14 July 2022; and warning messages were sent out to those who had not filed taxes on 26 July 2022. The exact date at which SMS were sent out each month is provided in Table A1 in the appendix All text messages were constrained to 150 characters in English and 70 characters in Urdu.

Reminder message text for each group were as follows:

- The *control* or baseline message: This reminder message used content that KPRA had been implementing since the inception of the program and can be considered to be the message that existed at baseline. The message stated: “*Ensure the payment of sales tax liable by the 15th of [month]. To avoid any legal trouble/difficulties, file returns before the 18th of [month].*”
- The *equivalent reciprocity* message: This message leveraged a sense of civic duty: “*Your tax money is used to bring beneficial programs like the Sehat card to Pakistanis. Do your civic duty and file your taxes by the 15th.*”

- The *loss aversion* message: This message made salient the financial and legal penalties of not filing tax on time: *“Payment of sales tax is due on the 15th. File now or risk incremental monetary fines; account deactivation and strict legal action.”*

Warning SMS were sent out to all registered tax-payers who had not paid before the 18th of the relevant month to remind them that they still need to file tax. These messages were typically sent out a week before the end of the month and were as follows:

- The *control* or baseline message, with status quo content, stated: *“According to KPRA’s record, you have not filed returns for [month]. To avoid any legal trouble/difficulties, file returns as soon as possible.”*
- The *loss aversion* warning message had a similar content as the loss aversion reminder message: *“Your continued failure to file taxes may lead to a penalty of Rs. 5000 or more and deactivation of your account. Please file your taxes immediately.”*⁴
- The *active choice* message made it clear that continued failure to file tax is a choice and will have serious legal repercussions: *“Deemed an oversight till now, your continued failure to pay taxes will be now treated as a conscious criminal activity by the KP government.”*

⁴ Tax policies stipulate a penalty of Rs 100 per day after the deadline has passed, which can accumulate to a maximum of Rs. 5000. Collection activities are at the discretion of Assistant and Deputy Collectors.

Overall, the 3x3 design results in 8 treatment groups, with messages different from the status-quo, placebo messages; and 2 control groups, 1 status quo or placebo group and the other a pure control group that receives no messages at all:

Table 1 - Structure of treatment and control groups

		Warning SMS			
		Baseline (BM)	Loss aversion (LA)	Active Choice (AC)	
Reminder SMS	Baseline (BM)	Baseline Control BM + BM	Treatment 1 BM + LA	Treatment 2 BM + AC	Pure Control- No reminder and no warning SMS No SMS
	Equivalent Reciprocity (EQ)	Treatment 3 EQ + BM	Treatment 4 EQ + LA	Treatment 5 EQ + AC	
	Loss Aversion (LA)	Treatment 6 LA + BM	Treatment 7 LA + LA	Treatment 8 LA + AC	

Note: The table summarises groups that registered taxpayers were randomised into. Each group is represented by a different reminder and warning message. Shortened names of message types are

given in parentheses. Text in italics provides the shorthand used in the report to refer to these groups.

Randomisation and baseline balance: The study is a randomised control trial (RCT). Registered tax-payers as of June 2022, were randomly allocated to one of the 10 groups outlined in Table 1. Note, text in italics in Table 1 provides the shorthand used in the report to refer to these groups in the rest of the discussion.

With individual randomization and a large sample size, the study has good balance on several characteristics across the ten groups (see column 2 of Table A2). Specifically, there is balance on gender of registered taxpayers if the entity is corporate (vs. non corporate) and time since first enrolled with KPRA. We have balance on all region and service sectors except automobile, hiring and withholding agent service sectors, which are a small proportion of the sample; and in taxpayers registered in the south region. To control for this imbalance, regression analysis included controls for sector and region fixed effects.

Key Results

In our analysis, we compare the compliance behaviour of taxpayers in each of the treatment groups and the pure control (no SMS) group relative to the placebo group that receives reminder and warning messages unchanged from baseline. Results are grouped in three main dimensions: I. The probability of filing on time, or up to 5 months after the due date; II, the days delay in filing (days past the 15th of the tax month); and III, the amount of tax filed.

(I) Behavioural messages have no impact on the probability of filing on time:

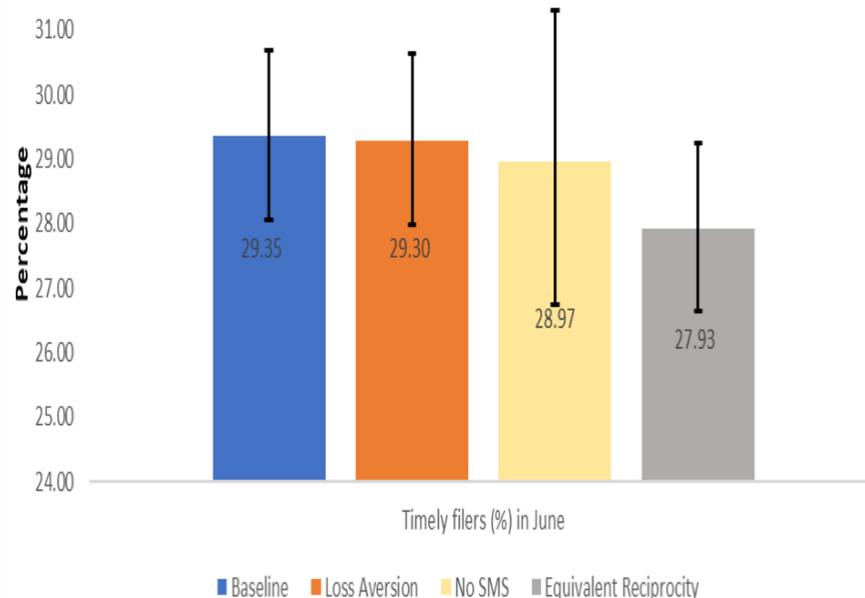
In the first month of the experiment, taxpayers allocated to the loss aversion and equivalent reciprocity reminder groups will have gotten messages different from the status quo, baseline messages. We tested if respondents in these groups were more likely to file monthly returns between having received the reminder message and the 18th of the month, when KPRA marks non-filers are late. Results are summarised in Figure 4. Compared to baseline compliance of 29.4%, 29.3% and 27.9% of the taxpayers in the loss aversion groups and equivalent reciprocity file taxes after having received the reminder messages before (or on) the 18th of the month. Though compliance in the equivalent

reciprocity group is slightly lower than the baseline group, it is not statistically different from the behaviour of the baseline messaging group.

Figure 5 shows the impact of intervention messages on the probability of filing tax for the study period months for up to 5 months after the due date per month. Each bar represents the probability within 5 months of the due date for all six months in the study. The BM+BM message group was 67.7 % likely to have filed taxes for the sample period. There are no significant differences in compliance from the baseline group in this period when reminder messages are changed to those that invoke reciprocity (EQ) or loss (LA); neither do they change when the warning messages refer to loss (LA) or not filing as a conscious criminal activity (AC).

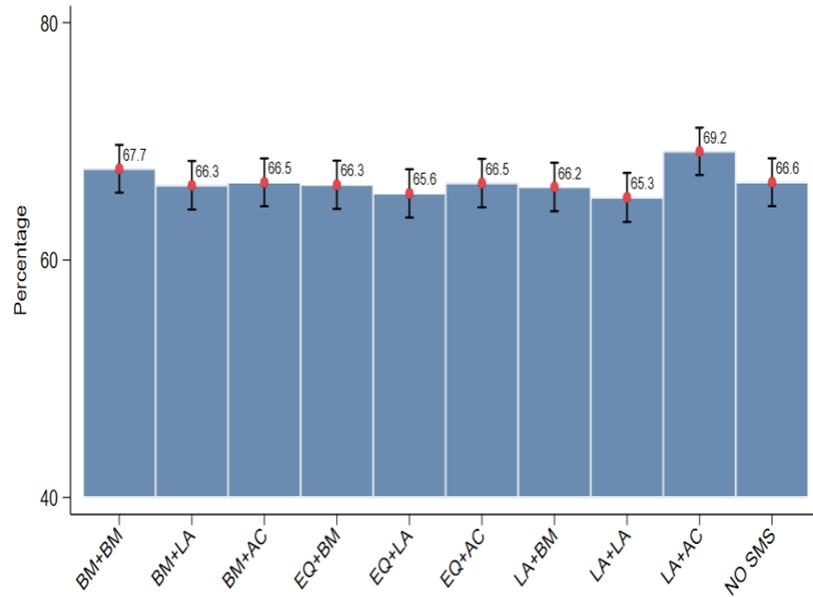
It is worth noting that the group that does not receive any SMS reminders or warnings, shown on the second to last graph in Figure 4 and the extreme right in Figure 5, do not have a significantly worse rate of compliance than any of the other groups, including the group that is receiving the usual, baseline messages. This suggests that the continued use of SMS for reminders and warnings may have limited and insignificant use for enhancing the compliance behaviour of taxpayers.

Figure 4 - Proportion of taxpayers in each group that pay before the 18th of the month after receiving the reminder message



Note: The figure provides average rates of timely filing (i.e. filed between the date the reminder message was sent out for June, and the 18th of the month). This time period is before any warning message was sent out, allowing the sample to be collapsed into 4 groups - BM, LA, EQ and No SMS groups. The number of taxpayers who had not filed taxes by the time the reminder message was sent are 4629, 4578, 1530 and 4601 for the BM, LA, No SMS and EQ groups, respectively. Vertical bars represent 95% confidence intervals.

Figure 5 - Average compliance in filing tax up to 5 months after date for June - November 2022



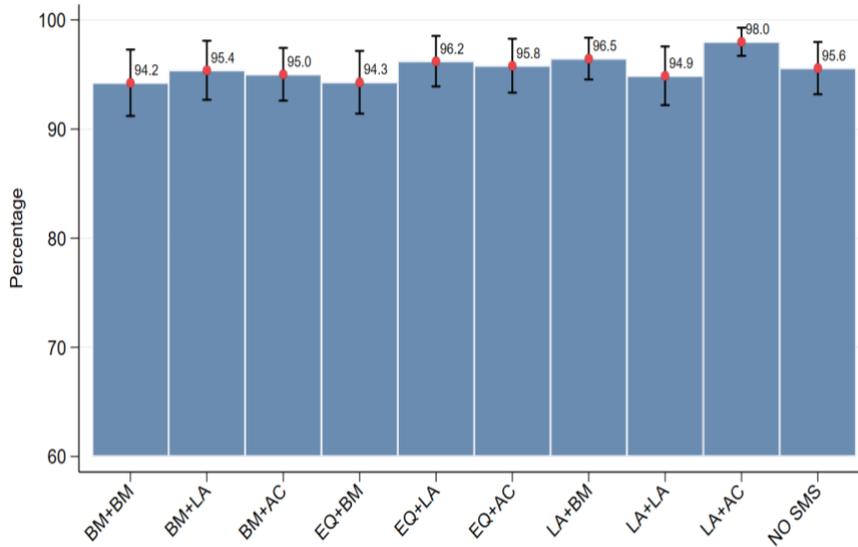
Note: Bars represent the probability of filing within 5 months of the due date for each intervention group defined in Table 1. BM refers to baseline, LA refers to loss aversion message, EQ refers to the equivalent reciprocity message and AC is the active choice message. Vertical lines represent 95% confidence intervals.

Though the differences between the new and baseline interventions are not significant on average, we test if certain sub-groups of taxpayers are more or less amenable to change in response to certain messages. Specifically, we look at two dimensions that can define the behaviour of taxpayers and can be considered weak

proxies of compliance: One, the amount of tax filed (if a positive amount is filed) and two, the number of years the taxpayer has been registered with KPRA. We explore sub-group analysis below.

First, we consider the subsample of taxpayers who have a positive average tax filed between June 2021 - May 2022. This gives a sample of approximately 3500 taxpayers. We then divide the subsample into two groups using a median split, that is, taxpayers filing more than the sample median are categorised as 'above-median' tax filers and those filing less or equal to the median tax filing amount are 'below-median' tax filers. We run the same analysis as above for the subsample of above-median filers. We find that among this sub-group of high tax filers, the loss aversion reminder and active choice warning combination leads to significantly higher likelihood of filing tax within 5 months of the due date - 98% compared to 94% for the baseline messaging group (Figure 6). The high tax-payer subgroup is arguably the group that is likely to be susceptible to messages making financial and legal penalties salient, and perhaps not surprisingly, we find they react to such warning messages.

Figure 6 - Average compliance in filing tax up to 5 months after date for June - November 2022, among taxpayers who file tax returns that are (equal or) more than the sample median.

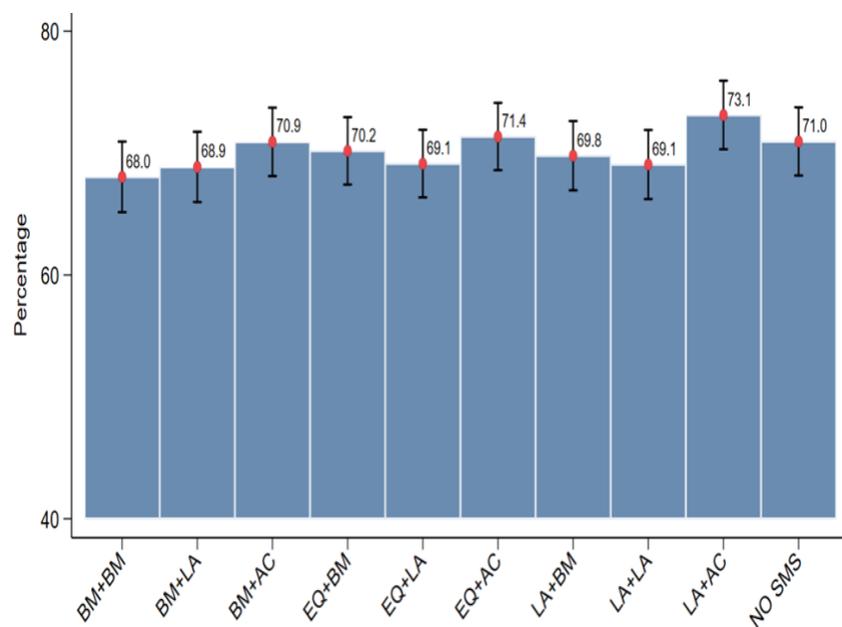


Note: Bars represent the probability of filing within 5 months of the due date for each intervention group defined in Table 1. BM refers to baseline, LA refers to loss aversion message, EQ refers to the equivalent reciprocity message and AC is the active choice message. The analysis is restricted to a subsample of equal and above-median tax filers. Vertical lines represent 95% confidence intervals.

Next, we consider the time taxpayers have been registered with KPRA. Early registration can be taken as a proxy of relatively better taxpayer behaviour given the general reluctance to enter the tax net in this setting. We divide the sample into two sub-groups, ‘early’ filers

who have been registered for equal or longer than the sample median of 2.5 years (or 30 months) and ‘recent’ filers who have been registered for less than 2.5 months. Results for early filers are shown in Figure 7. Similar to the results for the above-median amount taxpayers, here we find the loss aversion reminder and active choice warning message again improve compliance. Compared to baseline compliance of 68%, taxpayers in this subsample are 5 percentage points more likely to file taxes for the sample study period. We see no difference from baseline in the other messaging groups or the no SMS group. Interestingly, for the ‘recent’ filers, we see several message campaigns deteriorate compliance. The combinations of baseline with active choice and loss aversion, combinations of equivalent reciprocity reminder messages with either loss aversion and active choice, and not receiving any messages (no SMS) reduce filing likelihood from 68% for baseline to approximately 62% for these groups. Figure A2 in the appendix summarises these results. It is worth noting that the loss aversion and active choice combination continues to be a group of interest: recently registered taxpayers who receive this message are not any less likely to file returns in the sample period than the baseline group.

Figure 7 - Average compliance in filing tax up to 5 months after date for June - November 2022, among taxpayers registered with KPRA for (equal or) more than 2.5 years.



Note: Bars represent the probability of filing within 5 months of the due date for each intervention group defined in Table 1. BM refers to baseline, LA refers to loss aversion message, EQ refers to the equivalent reciprocity message and AC is the active choice message. The analysis is restricted to a subsample of tax filers who have been registered with the KPRA for equal or more than the sample median of 2.5 years. *** $p < 0.01$, ** $p < 0.05$, * < 0.10 . Vertical lines represent 95% confidence intervals.

II Behavioral messages reduce the delay in filing taxes:

Next, we explore if the new behavioural text messages perform differently from the baseline messages in reducing the delay in filing. That is, for individuals who do not file on the due date (15th of the month), we check if the delay in filing tax is statistically different from the delays experienced by the baseline (BM + BM) group. Results are depicted in Figure 8.

In the first month of the experiment, (June 2022 in Fig 8, top left corner panel), two combinations of the loss aversion messages reduce the delay in filing by approximately 4 days each. One, the baseline reminder message in combination with a loss aversion warning message. Second, the loss aversion reminder message in combination with the active choice warning message. These results suggest that nudging taxpayers to consider the financial and legal consequences of not paying on time can reduce the delay to file. A reduction of 4 days is meaningful. For instance, it could mean someone who typically pays after the 18th of the month - the last allowable date for filing before KPRA can take action - is likely to start paying on time on the 15th of the month as intended by the tax authority.

However, this effect is transient and disappears in the next month (July 2022). With the exception of a reduction of 3 days in delay from the baseline group for

the baseline reminder and loss aversion warning (BM + LA) group, all other coefficients are insignificant and close to 0.

Notice once again, that the no SMS group does not fare worse than the baseline messaging group - the point estimate is close to 0 and insignificant, once again highlighting that there was no impact of the original text messages that KPRA had been sending, relative to not sending any message at all.

A majority (56%) of the sample belongs to the construction sector. These entities drive the results depicted in Figure 6. Figure A3 in the appendix provides a similar summary of results when analysis is restricted to the construction sector only. The average reduction in delay in the first month for the BM + LA and LA + AC groups is approximately 6 days (compared to BM + BM group). However, similar to the results discussed for the overall sample, this effect is not sustained and disappears after the first month of the experiment, reappearing for the BM + LA group for November 2022.⁵

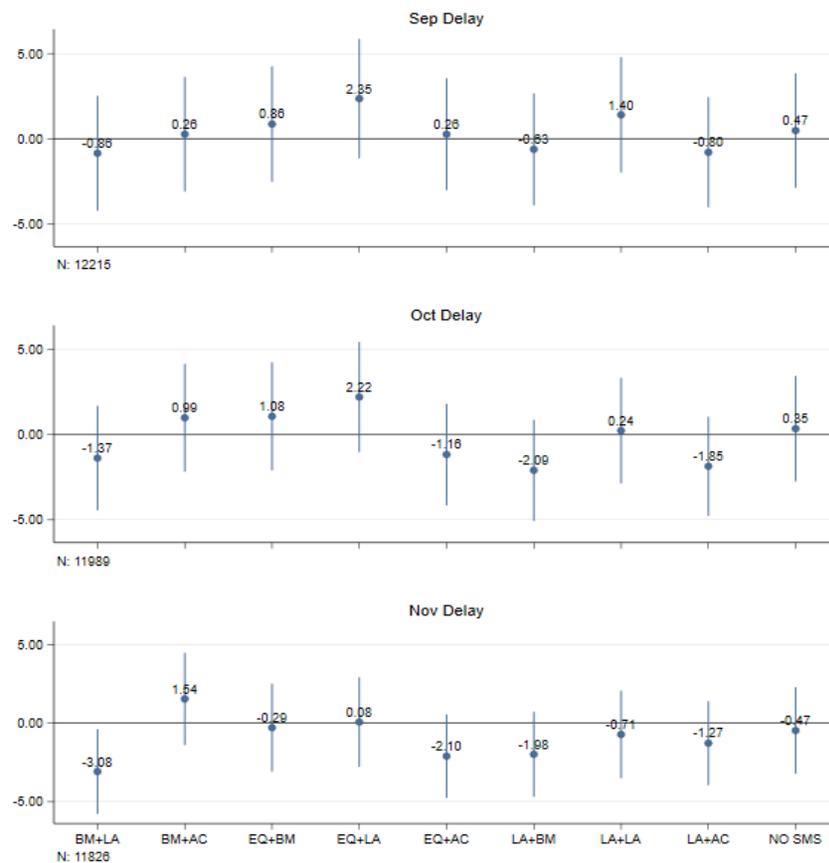
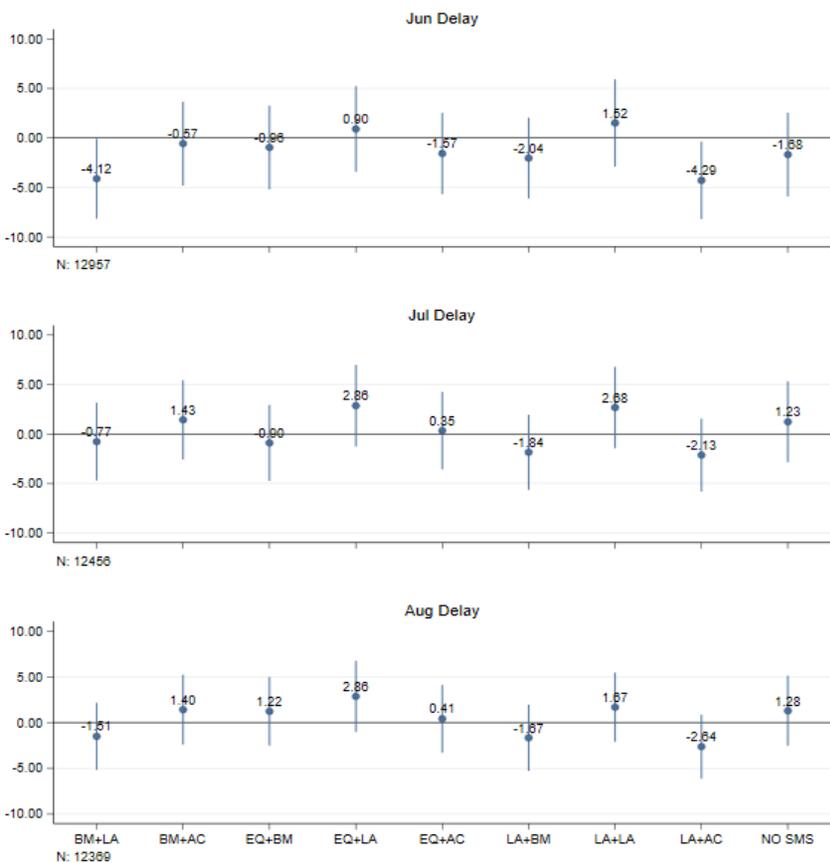
⁵ The hospitality sector reacts positively to the loss aversion reminder + baseline warning combination, reducing delay by 14 days compared to the baseline messaging group. However, this effect disappears after the first month. We test

III Behavioural messages have no impact on the amount of tax filed:

Next, we restrict the sample each month to registered taxpayers who do file monthly returns (whether on time or with a delay), and test if the behavioural messaging impacted the amount compared to the group receiving baseline messages. Two trends are worth noting: (i), the new behavioural messages did not lead to an increase or decrease of the tax amount filed compared to the baseline messaging groups. (ii), the amount collected in the no SMS group was not significantly different from the amount collected by the baseline SMS group. Table A3 in the appendix provides the regression results. We do not find any heterogeneity by sector, amount filed, or time registered with KPRA.

and do not find any heterogeneity in the average results by region or corporate status. There is insufficient variation in the gender of the registered taxpayer - under 3% are females - to check for heterogeneity by gender.

Figure 8 - Impact on delay in filing (days past due date) for each month, June - November 2022



Note: The graph plots point estimates from an OLS regression of days delay variable on binary indicators for the treatment message type (including the no SMS group), time enrolled with KPRA, corporate, region and sector fixed effects. Each panel represents results of a regression on delay in filing for the month specified on the top. The ‘

baseline’ (control) message group is the base group. Groups are as defined in Table 1. Vertical lines represent 95% confidence intervals. The number of observations in each month (taxpayers who do not file on or before the due date) is given by N and provided for each month separately.

Key Insights & Way Forward

There are three key lessons from the experiment:

- I. On average, the new SMS messages do not increase the probability of filing on time over and above the messages that are already being provided to taxpayers at baseline, nor do they increase the amount of tax filed.
- II. Subgroup analysis reveals potential improvements offered by the combination of loss aversion and active choice messages at the *intensive* margin. That is, it improves compliance behaviour of high tax filers and those who had been registered with KPRA for more than 2.5 years in June 2022 by 4 to 5 percentage points, respectively. Among more recent registered taxpayers, this combination does not lead to a deterioration, while other combinations of baseline and new intervention messages do lead to a 6 percentage point reduction in likelihood of filing in the observed study period.
- III. The combination of the loss aversion reminder and active choice message also reduced delays in filing, by approximately 4 days. However, this effect is short-term - effective for the first month

of the experiment - and driven largely by the construction sector.

- IV. Receiving no reminder or warning message does not lead to a deterioration in filing behaviour, except among more recently registered taxpayers, indicating the effectiveness of SMS as a medium of information or warning in this context may be generally limited and only relevant for certain sub-groups. This has important implications for the cost effectiveness of the current SMS reminder program.

In June 2023, we conducted qualitative interviews with tax accountants operating in the study context to understand taxpayer behaviour. Respondents did not recall any client highlighting a text in the message (e.g., one suggesting legal proceedings may be possible) as a cause for concern. This may be because phone users receiving many SMS and spam messages during the day do not pay attention to the reminder and warning messages sent by KPRA; they may have noticed the messages but not paid sufficient attention to the text themselves; or respondent fatigue may have set in due to receiving one or two SMS from the tax authorities every month. The latter is considered to be responsible for subdued response to a mix of TV and newspaper ads by FBR in 2014 in Pakistan (Cyan et al. 2017).

Second, in line with literature, the accountants also suggested that the penalties outlined - PKR 5000 financial penalty - may be considered to be too small to motivate a change in the filing behaviour. It may also be possible that the threat of legal proceedings or financial penalties is not credible if the threat is not followed through after the first month of the experiment, or if respondents are aware of precedent where legal penalties were circumvented.

Third, respondents outlined that warnings conveyed through letters are usually considered seriously by taxpayers. They are more likely to reach out to relevant authorities or to their accountants to follow the instructions outlined in the letters since this is a medium that is typically used in this context to initiate investigation or to inform recipients of pending action. Indeed, in other settings, e.g., in Guatemala, Chile and Costa Rica, personalised letters and emails have been very effective in prompting an improvement in taxpayer behaviour (see Kettle et al. 2016; Pomeranz 2015; Brockmeyer et al. 2019). In Costa Rica, for example, three features of enforcement emails tripled the rate of filing annual taxes: one, the emails mentioned the sanctions that follow failure to file; second, they were personalised and simplified so the information grabbed attention and was easy to comprehend; and third, they mentioned that the tax authority has access to third-party transactions (e.g., firm's transactions with suppliers who are tax-filers or made via credit card) to

understand the scale of firms expected revenues. The emails led to an almost immediate increase in filing rate by 20 percentage points - from 12 to 32 % - and improved accuracy of reported liabilities. There is a similar relatively higher impact by past compliance: those who filed and paid income tax in the past react stronger to the enforcement messages. This is similar to the result in this study setting, with taxpayers who had filed more in the past or registered with KPRA earlier responding to messages that remind them of legal and financial penalties by significantly increasing the likelihood of filing taxes over baseline rates.

Fourth, they indicate there may be other binding considerations that constrain compliance. Timely reminders may be more effective when they are complimented with a smoother or easier experience of filing taxes on the online portal. In the absence of a smooth filing process, taxpayers are likely to file only when they are pushed by tax officers and receive legal notices.

Potential Areas of Research

There are several potential avenues of research that can help design the optimal campaign for improving compliance. For instance, the results of the study suggest that the effectiveness of SMS messages may be limited because with the amount of marketing and spam messages that respondents receive in a day, SMS may be losing effectiveness as a medium of providing actionable information. In addition to letters, emails are a cost-effective means of providing reminders and warning. Taxpayers have found personalised information to be more credible in settings with low tax compliance. For example, in Costa Rica, warning emails led to a substantial increase in compliance among firms that were tax-registered but had not filed their taxes (Brockmeyer et al. 2019). The three key features of this email were that they were personalised, the text was simple and evoked social norms, and the information was lent credibility by mentioning the use of third-party information. Enforcement emails increased filing rate by 20 percentage points within five weeks, indicating the strong potential of personalised, credible enforcement messages.

Tests with different mediums - e.g., random personal visits, letters, or personalised emails, and follow-up taxpayer interviews can help disentangle the role that the medium of information plays in ensuring recipients pay attention to this information and consider it to be credible. Second, the frequency of contact and the timing of the messages are likely to be an important aspect of an effective communication strategy. Tests can reveal if two messages every month (reminder + warning) are optimal or too frequent, leading to respondent fatigue and reduced tax morale; and what is the optimal time to send reminders (e.g., a week in advance of the deadline) and warnings (e.g., when the tax authority is about to take action against not filing).

Third, research should focus on uncovering binding constraints to paying on time. Reminders imply that not filing is mainly a result of forgetting to file on time, but this is unlikely to be the case in this context. Respondents are likely to know the due date but may not file on time if (a) the process of filing is cumbersome and (b) if the potential penalties for filing late (or not all) are negligible. In such situations, they may only file when pushed by collection authorities to do so. Indeed, from anecdotal evidence from discussion with KPRA staff, this is indeed suspected to be the case - registered taxpayers file in response to notices to non-filers and increased efforts by tax officers after 5-6 months of non-response by taxpayers.

Fourth, the current study indicated potential heterogeneity by sector and month, which is an important consideration for KPRA to keep in mind while designing future interventions. More detailed research that tries to unpack taxpayer behaviour would be useful in developing a better understanding of the constraints and incentives that they may be responsive to, and therefore the set of measure KPRA may take to i) increase tax base, ii) to improve tax compliance amongst the existing taxpayers, iii) reduce tax evasions and improve the accuracy of tax returns filed amongst tax-filers (as most filers current file nil tax returns). A detailed analysis using taxpayer surveys can also reveal, for example, if messages should be customised by sector type. For instance, if invoking loss aversion may be particularly effective for the construction sector.

The implementation of tax reminders and enforcement warning messages has great potential for tax compliance. This study highlighted that telephone-based text messages invoking reciprocity have little value, while those that nudge via highlighting potential financial and legal penalties have meaningful but short-term effects on the delays in tax filing in the study context. SMS does not appear to be the optimal medium for effective communication with KPRA's registered taxpayers - the messages that KPRA had been sending prior to the experiment have also been shown to be ineffective. In addition, messages that made financial and legal penalties of non-compliance

salient improved the likelihood of filing at all (within 5 months) but only for high-tax filers. This result highlights the importance of the information being credible and relevant to be effective - which it was likely to be for the select group of registered 'compliant' taxpayers who typically file high tax returns.

These results underscore the importance of KPRA using experimental methods to evaluate the effectiveness of the enforcement interventions it uses, redesigning or discontinuing the ones that are not working, and scaling up the ones that are. Reminders have proven to be very effective tools in other countries and contexts. Further research can help design an effective reminder system, potentially by harnessing the power of technology and streamlining the filing process.

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Appendix

Table A1 - Date that baseline and intervention SMS messages was sent out each month

For the month of ..	Date of Reminder SMS	Date of Warning SMS
June	14 July 2022	26 July 2022
July	11 August 2022	31 August 2022
August	9 September 2022	23 September 2022
September	13 October 2022	21 October 2022
October	11 November 2022	22 November 2022
November	14 December 2022	22 December 2022

Table A2 - Sample characteristics and treatment balance at baseline

Variables	Mean (1)	Balance on treatments (p- value) (2)
Dummy - Registered taxpayer is male	0.973	0.886
Dummy - Corporate entity	0.210	0.196
Years enrolled with KPRA	2.733	0.404
Dummy - Sector: Advertisement	0.015	0.581
Dummy - Sector: Agents	0.031	0.803
Dummy - Sector: Automobile	0.005	0.027**
Dummy - Sector: Beauty Parlour Services	0.014	0.916
Dummy - Sector: Business Support Services	0.005	0.366
Dummy - Sector: Construction	0.564	0.654
Dummy - Sector: Consultancy Services	0.032	0.309
Dummy - Sector: Hiring	0.008	0.019**
Dummy - Sector: Hospitality	0.087	0.191
Dummy - Sector: IT Based Services	0.014	0.990
Dummy - Sector: Oil & Gas Sector Services	0.005	0.641

Dummy - Sector: Telecommunication/Broadcasting	0.014	0.255
Dummy - Sector: Transportation/Courier	0.083	0.831
Dummy - Sector: Withholding Agent	0.042	0.027**
Dummy - Sector: Workshop/Industrial Workshop	0.005	0.686
Dummy - Region: Peshawar	0.495	0.101
Dummy - Region: Mardan	0.226	0.161
Dummy - Region: South	0.131	0.072*
Dummy - Region: North	0.148	0.751

Note: Table reports the sample mean for characteristics at the start of the experiment (June 2022) in column 2. P-values in column 3 are from a test of equality from a regression of the characteristic given in the row on dummies representing control and treatment groups. N = 18087 for all variables except region, which is missing for 240 taxpayers, and gender which is not specified for 47 entities.

Table A3 - Intervention impact on amount filed

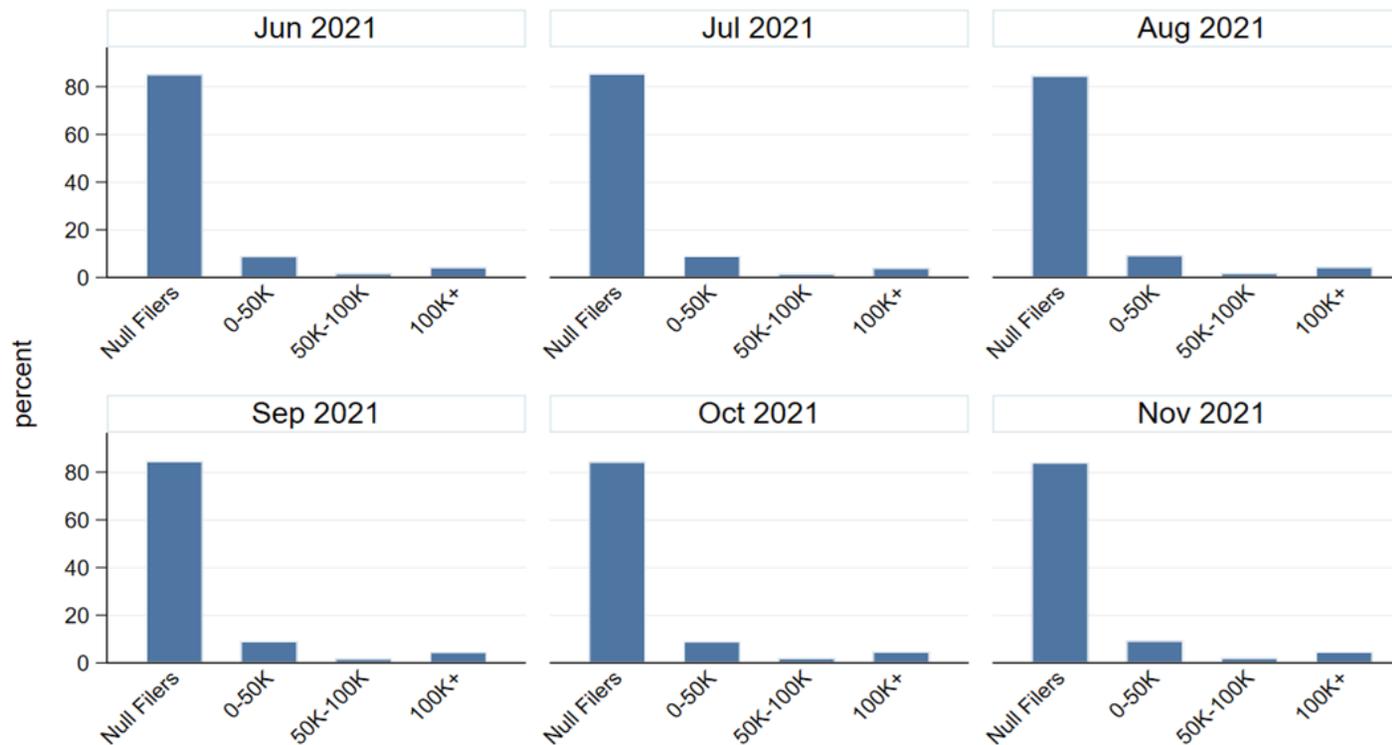
Dependent Var: Amount filed in returns (000's)						
Filing month:	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22
Experiment month:	1	2	3	4	5	6
<i>Messages: Reminder + warning</i>						
Baseline + Loss Aversion (BM + LA)	-55 (0.780)	5 (0.983)	-39 (0.873)	-36 (0.876)	6 (0.980)	103 (0.726)
Baseline + Active Choice (BM + AC)	-156 (0.375)	-131 (0.469)	-187 (0.353)	-138 (0.472)	-131 (0.498)	-127 (0.450)
Equivalent Reciprocity + Baseline (EQ + BM)	-131 (0.471)	-164 (0.370)	-185 (0.371)	-151 (0.438)	-168 (0.394)	-143 (0.405)
Equivalent Reciprocity + Loss Aversion (EQ + LA)	-125 (0.479)	-167 (0.351)	-203 (0.315)	-152 (0.426)	-143 (0.456)	-139 (0.405)
Equivalent Reciprocity + Active Choice (EQ + AC)	-155 (0.386)	-157 (0.395)	-164 (0.430)	-153 (0.429)	-132 (0.504)	-92 (0.598)
Loss Aversion + Baseline (LA + BM)	38 (0.891)	47 (0.865)	-14 (0.959)	-13 (0.961)	19 (0.944)	-31 (0.875)
Loss Aversion + Loss Aversion (LA + LA)	-156 (0.376)	-173 (0.339)	-184 (0.368)	-181 (0.347)	-197 (0.307)	-163 (0.334)
Loss Aversion + Active Choice (LA + AC)	-52 (0.783)	-94 (0.623)	-110 (0.612)	-125 (0.532)	-119 (0.553)	-53 (0.776)
No SMS	-83	-126	-142	-117	-91	-67

(0.658) (0.510) (0.506) (0.571) (0.662) (0.714)

Observations	12,456	12,369	12,215	11,989	11,826	11,654
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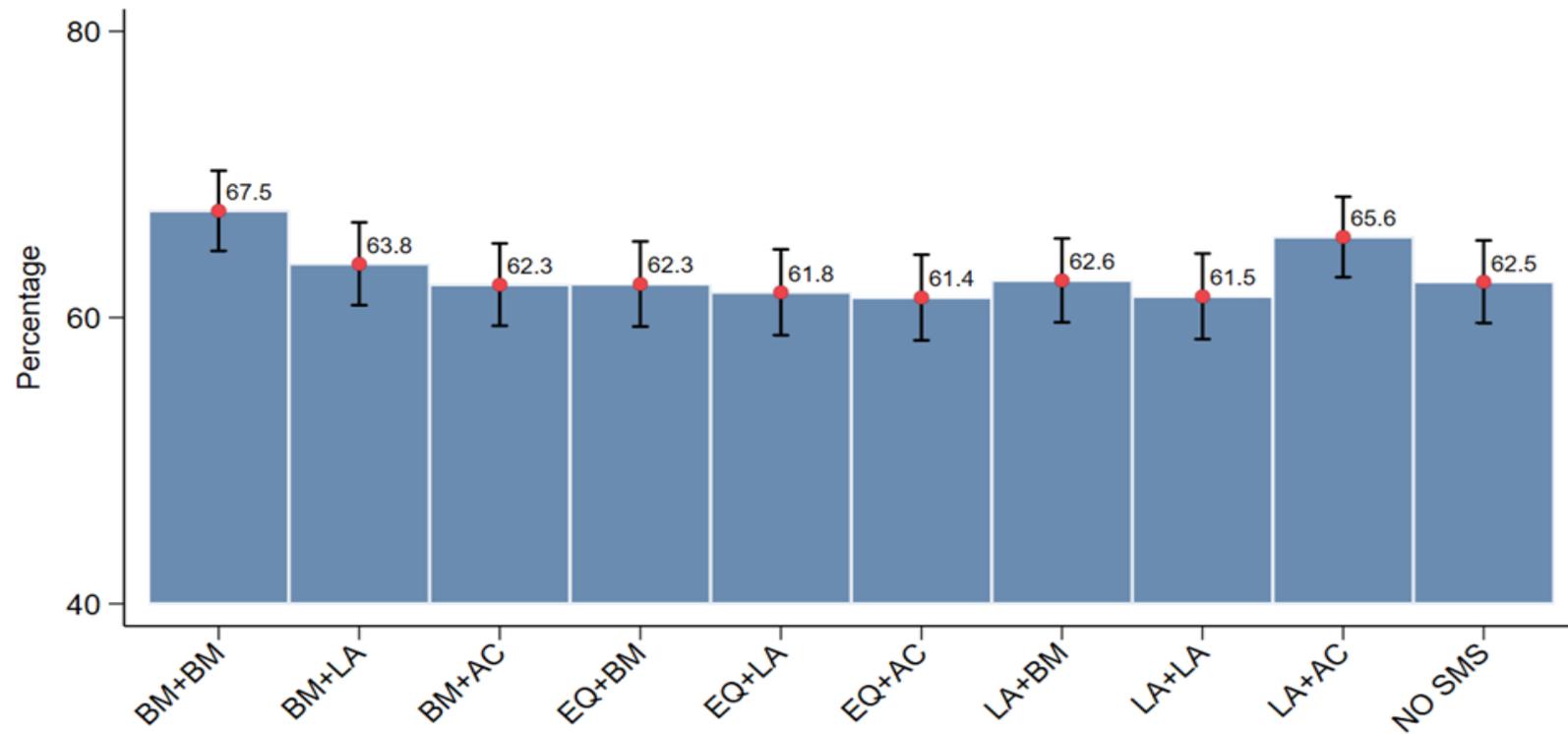
*Note: Estimates are from an OLS regression on all taxpayers who file in the referred month and include controls for time enrolled with KPRA, an indicator for whether the entity is a corporate entity, and sector and region fixed effects. Robust p-value in parenthesis. *** p < 0.01, ** p < 0.05, * p < 0.1.*

Figure A1 - Distribution of amount of tax filed for the sub-sample of taxpayers who filed (any) monthly return for June - November 2022.



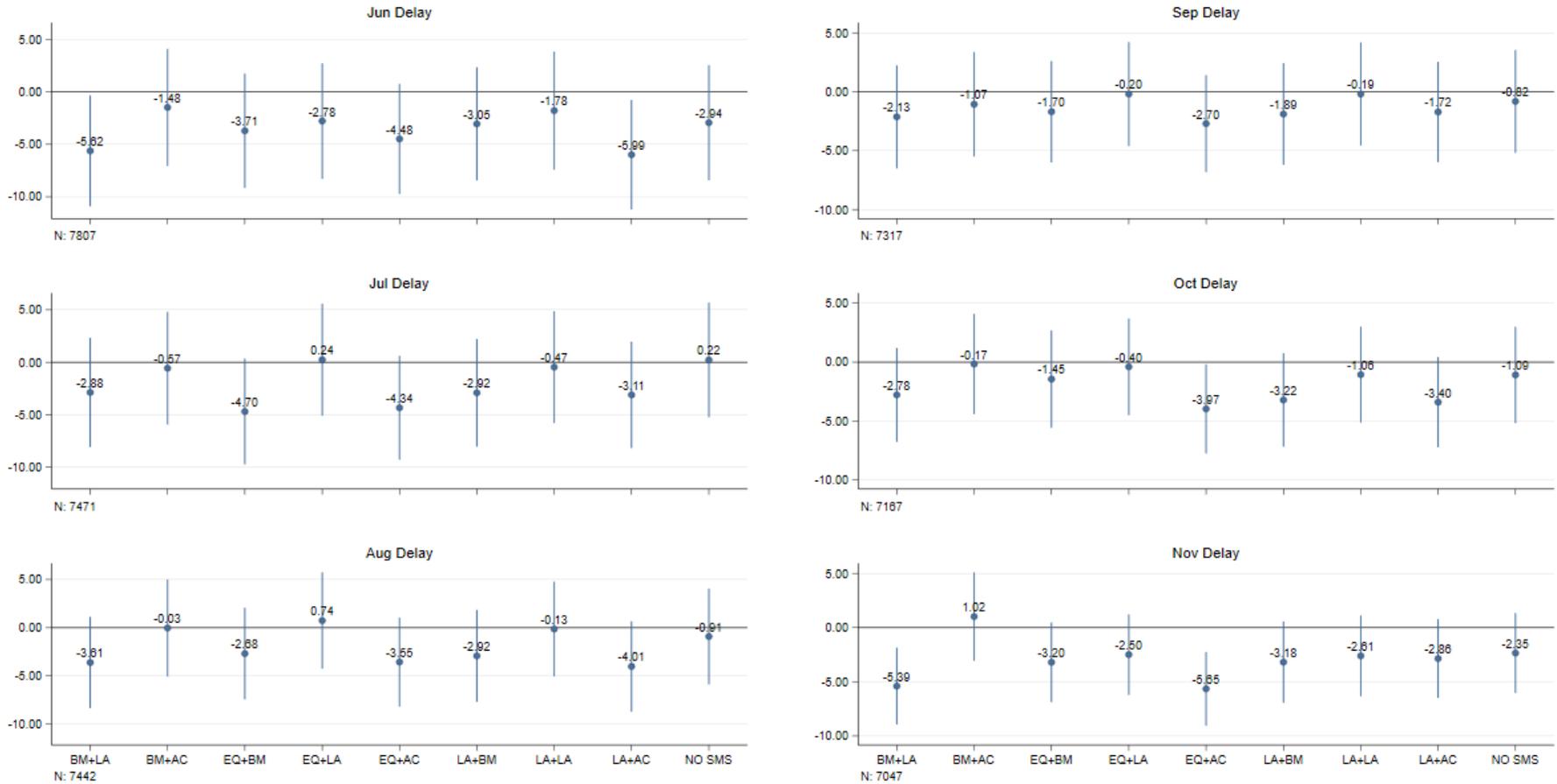
Note: The graph plots the distribution of tax filed among the sub-sample of registered taxpayers who filed taxes for the month mentioned on top of each panel. The y-axis plots proportion of tax-filing sample and the x-axis plots the amount filed.

Figure A2 - Average compliance in filing tax up to 5 months after date for June - November 2022, among taxpayers registered with KPRA for less than 2.5 years



*Note: Bars represent the probability of filing within 5 months of the due date for each intervention group defined in Table 1. BM refers to baseline, LA refers to loss aversion message, EQ refers to the equivalent reciprocity message and AC is the active choice message. The analysis is restricted to a subsample of tax filers who have been registered with the KPRA for less than the sample median of 2.5 years. Vertical lines represent 95% confidence intervals. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.*

Figure A3 - Impact on delay in filing (days past due date) for each month for Construction Sector only, June - November 2022.



Note: The graph plots point estimates from an OLS regression of days delay variable on binary indicators for the treatment message type (including the no SMS group), time enrolled with KPRA, corporate and region fixed effects, for the construction sector only. Each panel represents results of a regression on delay in filing for the month specified on the top. The 'baseline' (control) message group is the base group. Groups are as defined in Table 1. Vertical lines represent 95% confidence intervals. The number of observations in each month (taxpayers who do not file on or before the due date) is given by N and provided for each month.

Utilising Behavioural SMS Intervention to Enhance Tax Filing in Khyber Pakhtunkhwa

